



## Dr. Frederick F. Stewart

*Significant research in membrane separations, liquid and solid polymer battery electrolytes, and polymer synthesis.*

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### Education

Dr. Frederick Stewart received his Bachelor of Arts (ACS certified) degree in Chemistry in 1986 from St. Anselm College (Manchester, NH) and his Ph.D. in Chemistry from Montana State University (Bozeman, MT) in 1992.

### Experience and Achievements

Dr. Stewart has been employed at the INL since 1992 where he is currently the group leader of the Materials Chemistry group in the Chemical Sciences department.

Dr. Stewart's research interests are in the areas of membranes, battery electrolytes, and novel polymer synthesis. Membranes are selectively permeable barriers for conducting chemical separations, either liquid or gas. In this endeavor, he has published 18 peer-reviewed publications and numerous non-peer-reviewed papers addressing this subject. In the promotion of membrane science, he served as the program co-chair for the 14th annual North American Membrane Society meeting in 2003. Dr. Stewart has also dedicated significant time to developing novel non-flammable and highly conductive solid polymer and liquid electrolytes for lithium batteries. In this work, he has several patents, publications and an award from DOE for the most significant technology derived from the complex within the first 23 years of DOE's existence (2000 Department of Energy "Bright Light Award" for consumer-oriented technological inventions (solid polymer electrolyte (SPE) battery development.) Best new technology in the DOE National Laboratory complex from 1997-1999). These technologies are currently licensed and being developed for commercialization. Dr. Stewart also pursues basic research in polymer science. The goal of this work is to develop novel materials based upon polyphosphazene chemistry for which he has published an additional 14 peer-reviewed papers on the subject with several being invited contributions.

## INL'S LIFETIME ACHIEVEMENT AWARD FOR INVENTORSHIP

### Patents

- U.S. Patent 6,146,787- Solid Polymer Battery Electrolyte and Reactive Metal-Water Battery
- U.S. Patent 6,403,755 - Polyesters Containing Phosphazene, Method for Synthesizing Polyesters Containing Phosphazenes
- U.S. Patent 6,544,690 - Self-Doped Molecular Composite Battery Electrolytes
- U.S. Patent 7,008,564 - Cured Composite Materials for Reactive Metal Battery Electrolytes
- U.S. Patent 7,074,256 - Phosphazene Membranes for Gas Separations